

AMENDMENTS TO THE CLAIMS

1. (currently amended) A ~~[[M]]~~method for controlling additions of powder materials into an electrolytic cell (1) designed for the production of aluminium by fused bath electrolysis and provided with at least one powder material distributor (20) and at least one boring device (30) comprising an actuator (31) and a crustbreaker (33), ~~the~~ said cell containing a liquid electrolyte bath (7) and being operated such that an alumina and solidified bath crust (10) is formed above the liquid electrolyte bath (7), ~~method in which~~ wherein at least one opening (11) is formed in the said crust (10) using the boring device (30) and powder material is added through at least one opening (11) using a determined procedure for introducing additions in the bath, ~~referred to by the expression "normal feed procedure", and characterized in that further wherein:~~

- providing the boring device with at least one position detector capable of detecting at least one determined low position,
- at a determined time t_0 , generating an electrical signal S ~~is generated~~ to provoke lowering of the crustbreaker (33) using the actuator (31),
- measuring the moment $[[t]]$ at which the crustbreaker (33) reaches a predetermined low position ~~P is measured,~~
- determining the value of at least one powder material feed operation indicator ~~is determined,~~ using a function $F(t_0, t)$,
- using at least one operation criterion and the value of the operation indicator(s) ~~F are used~~ to determine whether ~~or not an~~ operation is abnormal,
- if the operation is not considered to be abnormal, ~~the normal feed~~ maintaining said determined procedure ~~is maintained,~~
- if operation is considered to be abnormal, triggering at least one correction procedure called a "regularisation / normalisation" ~~procedure is triggered,~~ that can restore normal operation of the powder material feed.

2. (currently amended) A [[C]]control method according to claim 1, ~~characterised in that~~ wherein an operation indicator is given by a descent duration D difference that is equal to a function $F(t-t_0)$, called the "descent duration" D of the difference between a time t_0 and a time t .
3. (currently amended) A [[C]]control method according to claim 2, ~~characterised in that~~ wherein operation is considered to be abnormal if the descent duration D is higher than a determined high threshold Sh , in at least Nh successive determinations.
4. (currently amended) A [[C]]control method according to claim 3, ~~characterised in that~~ wherein Nh is an integer number between from 1 and to 10 inclusively.
5. (currently amended) A [[C]]control method according to ~~any one of claim[[s]] 2 to 4,~~ characterised in that wherein operation is considered to be abnormal if the descent duration is longer than a determined threshold Sh' determined in at least Nh' determinations out of N , ~~in other words if~~ such that the ratio Nh'/N is more than a given value Rh .
6. (currently amended) A [[C]]control method according to ~~any one of claim[[s]] 3 to 5,~~ characterised in that wherein the ~~thresholds Sh and~~ threshold Sh' are equal to a fixed value or a value calculated using several values for the duration D, that are successive or separated by intermediate values.
7. (currently amended) A [[C]]control method according to ~~any one of claim[[s]] 2 to 6,~~ characterised in that wherein operation is considered to be abnormal if the descent duration is less than a determined low threshold Sb in at least Nb successive determinations.
8. (currently amended) A [[C]]control method according to claim 7, ~~characterised in that~~ wherein Nb is an integer number from 1 to 10 inclusively.

9. (currently amended) A [[C]]control method according to ~~any one of claim[[s]] 2 to 8,~~
~~characterised in that~~ wherein operation is considered to be abnormal if the time t cannot be
measured after a time T exceeding a maximum determined threshold T_{max} .
10. (currently amended) A [[C]]control method according to claim 9, ~~characterised in that~~
wherein the threshold T_{max} is ~~between~~ from 5 and to 15 seconds.
11. (currently amended) A [[C]]control method according to ~~any one of claim[[s]] 1 to 10,~~
~~characterised in that~~ wherein an operation indicator, ~~called the drift indicator,~~ is determined from
a deviation E between at least two values of the duration D , either successive or separated by
intermediate values.
12. (currently amended) A [[C]]ontrol method according to claim 11, ~~characterised in that~~
~~the~~ wherein said deviation E is given by ~~the~~ an algebraic difference between two successive
values of the duration D or two values separated by intermediate values.
13. (currently amended) A [[C]]ontrol method according to claim 11, ~~characterised in that~~
~~the~~ wherein said deviation E is given by a mean deviation or a statistical deviation between at
least three successive values of the duration D , or three values separated by intermediate values.
14. (currently amended) A [[C]]ontrol method according to ~~any one of claim[[s]] 11 to 13,~~
~~characterised in that~~ wherein operation is considered to be abnormal when the said deviation E is
greater than a determined threshold Se .
15. (currently amended) A [[C]]ontrol method according to ~~any one of claim[[s]] 1 to 14,~~
~~characterised in that the~~ wherein said ~~regularisation / normalisation~~ correction procedure
comprises at least one automatic or manual action to correct operation of the boring device (30).

16. (currently amended) A [[C]]control method according to ~~any one of claim[[s]] 1 to 15,~~
~~characterised in that wherein~~ the cell (1) comprises at least two boring devices (30) each
associated with a distinct powder material distributor, (20) and ~~in that further wherein~~ the
~~regularisation / normalisation~~ correction procedure includes an at least temporary interruption of
the feed by the distributor associated with the boring device for which operation is considered to
be abnormal.

17. (currently amended) A [[C]]control method according to claim 16, ~~characterised in that it~~
wherein said method comprises distributing the feed of powder material on ~~the other~~ another
distributor(s) in the cell.

18. (currently amended) A [[C]]control method according to ~~any one of claim[[s]] 1 to 17,~~
~~characterised in that wherein~~ when operation of at least one boring device (30) is considered to
be abnormal, the control method also comprises a modification of the ~~normal feed~~ determined
procedure.

19. (currently amended) A [[C]]control method according to ~~any one of claim[[s]] 1 to 18,~~
~~characterised in that wherein~~ the determined low position is ~~the~~ a position at which the
crustbreaker (33) comes into contact with the liquid electrolyte bath (7).

20. (currently amended) A [[C]]control method according to ~~any one of claim[[s]] 1 to 18,~~
~~characterised in that wherein~~ the determined low position is ~~the~~ a lowest position allowed by the
actuator (31).

21. (currently amended) A [[C]]control method according to claim 21 1, ~~characterised in that~~
wherein the boring device or each boring device (30) comprises at least one jack fitted with ~~the~~
said position detector (40).

22. (currently amended) A ~~[[C]]~~control method according to claim 21, ~~characterised in that~~ the wherein said detector (40) is a stroke end detector.

23. (currently amended) A ~~[[C]]~~control method according to ~~any one of claim[[s]] 21 to 23~~ 1, ~~characterised in that wherein~~ the position detector (40) is ~~chosen from among~~ at least one selected from the group consisting of mechanical detectors, electrical detectors, optical detectors, or magnetic detectors, and detectors comprising any combination of these means thereof.

24. (currently amended) A ~~[[C]]~~control method according to ~~any one of claim[[s]] 1 to 24,~~ ~~characterised in that wherein~~ the electrical signal ~~[[S]]~~ transmits the crustbreaker lowering order electrically, optically, and/or pneumatically.

25. (currently amended) A ~~[[C]]~~control method according to ~~any one of claim[[s]] 1 to 25,~~ ~~characterised in that wherein said~~ powder materials are ~~chosen~~ selected from ~~among~~ the group ~~including~~ consisting of alumina based powders, aluminium fluoride powders ~~or~~ and cryolite based powders.

26. (currently amended) A control ~~[[S]]~~system (50) for controlling additions of powder materials into an electrolytic cell (1) designed for the production of aluminium by fused bath electrolysis and provided with at least one powder material distributor (20) and at least one boring device (30) comprising an actuator (31) and a crustbreaker (33), ~~the~~ said cell containing a liquid electrolyte bath (7) and being operated so as to form an alumina and solidified bath crust (10) above ~~the~~ a liquid electrolyte bath (7), ~~characterized in that it~~ wherein said system comprises:

- a means (51) of generating an electrical signal ~~[[S]]~~ capable of causing the crustbreaker (33) to be lowered by means of the actuator (31) at a determined time t_0 ,
- a device (52) for measuring the moment t at which the crustbreaker (33) reaches a determined low position ~~[[P]]~~, said device comprising at least one position detector capable of detecting said determined low position,

- a means ~~(53)~~ called a diagnostic means of determining the value of at least one feed operation indicator $F(t_0, t)$ starting from the a value of the time t_0 and the a value obtained for the time t .

27. (currently amended) A ~~[[C]]~~ control system (50) according to claim ~~28~~ 26, characterised ~~in that the~~ wherein said detector (40) is integrated into the boring device(s) ~~(30)~~.

28. (currently amended) A ~~[[C]]~~ control system (50) according to claim 27, characterised ~~in that the~~ wherein said detector (40) is integrated into the said actuator (31) in each boring device (30).

29. (currently amended) A ~~[[C]]~~ control system (50) according to claim 28, characterised ~~in that~~ wherein the actuator (31) comprises a jack fitted with the said detector (40).

30. (currently amended) A ~~[[C]]~~ control system (50) according to ~~any one of claim[[s]] 28 to 31~~ 26, characterised ~~in that the~~ wherein said detector (40) is a stroke end detector.

31. (currently amended) A ~~[[C]]~~ control system (50) according to ~~any one of claim[[s]] 28 to 32~~ 26, characterised ~~in that~~ wherein the detector (40) is chosen at least one selected from among the group consisting of mechanical detector, electrical detector, optical detector, or magnetic detectors, and detectors comprising any combination ~~of these means~~ thereof.

32. (currently amended) A ~~[[C]]~~ control system (50) according to ~~any one of claim[[s]] 26 to 33~~, characterised ~~in that~~ wherein the control system (50) ~~according to the invention~~ comprises a regulator (54).

33. (currently amended) A ~~[[C]]~~ control system (50) according to ~~any~~ claim 32, characterised ~~in that~~ wherein the regulator (54) comprises specific means of implementing the automatic

actions intended to correct operation of ~~[[a]]~~ said boring device (30) when an operation indicator $F(t_0, t)$ reveals abnormal operation of the feed.

34. (currently amended) A ~~[[C]]~~ control system (50) according to ~~any one of claim~~ ~~[[s]]~~ 26 to 35, ~~characterised in that~~ wherein said powder materials are ~~chosen~~ selected from ~~among~~ the group ~~including~~ consisting of alumina based powders, aluminium fluoride powders ~~or~~ and cryolite based powders.

35. (new) A control method according to claim 3, wherein the threshold Sh are equal to a fixed value or a value calculated using several values for the duration D , that are successive or separated by intermediate values.